Model Estimation of HTPEM Mea Parametersfrom EIS and IV Curves

Vang, Jakob Rabjerg; Zhou, Fan

Publication date:
2015

Document Version
Accepted author manuscript, peer reviewed version

MODEL ESTIMATION OF HTPEM MEA PARAMETERS FROM EIS AND IV CURVES

Jakob Rabjerg VANG[1], Fan ZHOU[1]

[1]Aalborg University, Denmark, jrv@et.aau.dk

Impedance spectra can be a valuable supplement to polarisation curves when characterising a fuel cell membrane-electrode-assembly (MEA). This work presents a finite-volume based high temperature PEM (HTPEM) fuel cell model for estimating MEA parameters from impedance spectra and polarisation curves by simultaneous fitting. One of the challenges in the model development concerns the modelling of the catalyst layer. This work explores the impact of some of the different assumptions on the fit and the estimated MEA parameters.

One of the most important choices is that of catalyst layer (CL) model. Two different CL models have been implemented. One assumes that the Pt catalyst sits on the surface of the carbon substrate and is covered by a thin film of phosphoric acid (PA). The other approach assumes that the catalyst particles are collected in agglomerates flooded with PA. The fits are compared in the figures. Note that the agreement with the data is similar for the two catalyst models. The parameter values estimated generally agree well with available data from literature and are mostly similar regardless of the CL model. Only the CL PA content, the CL thickness, and the surface area of the CL pores vary significantly between CL models. The discrepancies relate to differences in reactant transport characteristics of the CL models. The PA content also deviates from literature values. This is assumed to result from PA migration during operation.

The model is suitable for the analysis of data from degradation tests.